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Sandia Laboratory researchers are using an unmanned airplane, which can reach altitudes above 50,000 feet, to study clouds above Kauai.

## Scientist uses pilotless airplane to help unravel clouds' secrets

By Glenn Roberts Jr.  
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LIVERMORE — Will Bolton doesn't look for animal shapes or faces in cloud formations.

"When I look at the clouds, I'm thinking: 'Is that a good set of clouds to go fly with?'"

A scientist at Sandia National Laboratories, Bolton is technical director for a high-flying research program that is unraveling the secrets of the skyward realm where clouds dwell.

Using a pilotless airplane called "Altus," Bolton and a team of cloud researchers hope to learn how clouds store and release energy.

By deciphering cloud behavior, the research may improve scientific understanding of global warming and weather prediction.

"The principal source of uncertainty in predicting (global warming) is in the role clouds play," Bolton said. "The goal of the whole program is to improve understanding of radiant energy in clouds."

On Thursday, Altus will fly one of several missions above the Hawaiian island of Kauai to study cirrus clouds, which are

made of ice crystals.

Speaking from the Pacific Missile Range Facility in Kauai on Tuesday, Bolton said cirrus clouds are important to the research program because they are at the boundary of two layers of the earth's atmosphere: the troposphere and stratosphere.

"(Cirrus clouds) are involved in the process of moving water vapor between the troposphere and stratosphere," he said, and their height makes them difficult to study.

Altus, which carries a payload of high-tech sensors and gadgetry that map and analyze cloud formations, typically flies at an altitude of 50,000 feet or higher.

Nearly 40 researchers have contributed to the cloud-study program, including scientists from the U.S. Department of Energy, NASA, a dozen universities and four private companies; more than half of them are in Kauai this month.

Lawrence Livermore and Los Alamos laboratories have contributed to the effort, Bolton said. Livermore Lab helped to develop a laser-radar, known as

help detect clouds.

Other sensors can study the thickness of clouds and make it possible to study water particle and droplet sizes within clouds and to capture a cross-section of a cloud.

A piloted plane, known as the Twin Otter, flies below the remotely controlled Altus to help study clouds from two perspectives.

Bolton calls this a "cloud sandwich" — the clouds are the "baloney" and the aircraft are the "bread."

The next series of Altus flights will be conducted in Monterey after the May 19 wrap-up of the Kauai flights, Bolton said. After that, the Altus will fly research missions in Oklahoma.

That state, as was evidenced during the tornado disasters this week, has "highly variable and interesting weather," he said. The Department of Energy has weather-monitoring stations in the Oklahoma City area that will prove useful for the cloud team's research, he added.

Eventually, the plan is to take Altus to the tropics, he said, and "going to Hawaii is one step